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The Chinese Communist emphasis on building an industrial base is strongly supported by many facts. Materials required to build machine tools or other industrial plant facilities are used for these specific purposes first. If any material remains it can then be used for commercial products. In addition, the curriculum for the polytechnical universities have more specialities in the field of Machine and Machine tool building than in any other field.

The Chinese have been building fighter and light transport aircraft for

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the bomber aircraft which the Soviets will most likely make available to the Chinese for assembly or production. Development of modern bomber aircraft is beyond the capability of the Chinese Communist during the period of this estimate.

The greatest scientific effort is in the fields of nuclear energy and electronics. The activities in these fields are primarily pure research (nuclear energy) and commercial application (electronics). Aeronautical activities are generally limited to the design and building of small aircraft by university faculty and students and very little research is being done.

A more detailed discussion of the capabilities of the Chinese Communist in electronics, propulsion, materials, nuclear science, and weapons development follows.

#### Electronics:

Chinese authorities have indicated that electronic research enjoys a position second only to nuclear science. However, the emphasis at present is on developing the technology rather than weapon subsystems.

About 30 "research institutes" with some capability in electronics are known to exist. In the vast majority, however, electronics is a minor sideline. For example, in several, the capability is being devoted to the construction of scientific instrumentation, particularly computers for furthering the research in the specialty of the institute. In all, only about five of these institutes seem to have any real capability in general electronics, and these seem to be occupied with problems associated with industrial expansion. Semiconductor product technology seems to be receiving the most attention.

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Although 83 electronic factories have been identified, only a handful have a capability for anything other than to produce foreign components, communications and entertainment equipment, or the simpler types of test equipment. Communist China is now relatively self-sufficient in these areas. In a few instances, somewhat more complex equipment is manufactured, probably with facilities and supervision supplied by the USSR or its satellites. These products include spare parts, such as magnetrons and klystrons, for military equipment, as well as multi-channel carrier communication equipment. Instances of the production of even more complex native equipment, such as radar, have been noted. Considering the overall electronics capability and the absence of any quantity deployment of these radars, it seems probable that their construction was a demonstration of capability by one of the research institutes.

We can expect the native capability in electronics to increase rapidly, even if foreign assistance should cease, but they still have a very long way to go. Building up their industry, including the communication and propaganda network is likely to require their entire capability for some time. Until this is accomplished, in approximately ten years, any quantity production of military subsystems, such as radar, airborne electronics, or missile guidance electronics, will be limited to "Chinese" copying of USSR or Satellite subsystems.

#### Propulsion

Rocket propulsion - It is within the current capability of Communist China to develop and produce the necessary propulsion system for a short range missile or a third stage of a satellite vehicle. Any rockets now in production are probably of the solid propellant type. There is no evidence to support a capability for production of liquid propellant rocket engines or large solid propellant rockets. It has been reported that the Mechanics Institute has

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successfully test fired a short range missile called the Firerat and a meteorological rocket, which if true, establishes a current capability for the propulsion of short range missiles.

Rocket propulsion research for future systems is known to be in progress under the able leadership of U.S. trained Dr. Chien Hseuh-Hsen who is in charge of the Mechanics Institute of the China Science Academy. The next five years should result in considerable advancement in the state-of-the-art of propulsion technology in China. It can be expected that propulsion systems for medium range tactical rockets and various short range missiles will be developed within this time period.

**Turbojet Propulsion** - Current intelligence reports indicate that Communist China presently has a very meager capability for development of aircraft gas turbine engines. Although assembly of Soviet VK-1 and VK-1A type engines has been underway in that country for several years, the Chinese contributed nothing to the development.

**Materials:**

**Non Metals** - Information on materials, from Communist China is on the whole very slight. Comments and predictions based upon such scanty information must of necessity be couched in very general terms.

Aside from the most common everyday materials, Communist China seems to be dependant upon the Soviet Union for the major portion of its materials. In the rubber and plastics field it is known that the Chinese Communists possess the ability to produce synthetic rubber of the butadiene-styrene (GR-S) type, high-pressure polyethylene, and phenol-formaldehyde resins. No information is available regarding their ability to supply their total requirements of even these materials.

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It is known that strenuous efforts are underway to improve their position toward self-sufficiency in the fuel and oil resistant rubbers, in moderately high temperature-resistant silicone rubbers, and in glass fiber. The utilization of the latter product was slanted toward textile uses.

A number of papers have reported research work at the University of Peking in polymer technology intended for high temperature and aerospace applications. This research is headed by Wang-Pao Jen. The consensus is that there is a moderate amount of very good work going on in Communist China. This work is increasing rapidly and may soon approach an appreciable significance. At this time, however, the Chinese Communists are technologically dependent upon the Soviet Union for the major portion of their materials requirements.

**Metals** - The metals industry of Communist China, encompassing the research, development, production and application of metals and alloys, is in a period of initial growth which must be considered rapid. The Chinese are actively engaged in various phases of ferrous and non-ferrous metals development; however, their major effort appears to be directed toward increasing productive capability in the ferrous metals industry. Dependence on the Soviet Union for materials has been held, either by desire or by necessity, to a minimum by concentrating on those materials which are available in China. The allocation of materials has been controlled so that those materials which are short in supply are used only to increase the production of other needed materials. This deviates from the normal process of allocating materials for end product applications. While

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Soviet Union. Apparently the Soviets are either unwilling or unable because of their own needs to supply the Chinese with large quantities of these materials.

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The only materials which the Soviets have supplied to the Chinese in appreciable quantities are those in connection with nuclear power reactors. In this field, China is wholly dependent on the Soviets for reactors, reactor materials, fuel, heavy water, etc., and the Russians have supplied sufficient quantities of these materials to support a nuclear power program.

The Chinese have oriented their studies to make the greatest use of the materials which are native to China. A great deal of work has been done in developing the iron-tungsten-silicon high temperature alloy system. This system makes use of those alloying elements which are abundant in China and require little or no chromium and nickel, materials which would have to be procured from outside the Chinese People's Republic.

The leaders in the field of research who have attained prominence and undoubtedly set the pace and direction of metallurgical research, have, as a general rule, been trained in the West. The majority of these scientists received training in the United States although other Western countries have provided some of this training. The impact on the materials field of the Western trained scientists and the younger Soviet trained group remains to be seen. It can be anticipated that during the next few years the blending of these ideas will produce significant results in the metallurgical field.

The materials for the production of high performance aircraft and air weapons are not generally available in China in sufficient quantities to provide a threat to the West. Some aluminum is produced but on a relatively small scale. It must be emphasized that, for the present, the Chinese depend on the

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basic iron and steel industry is developed. In summary, if the Chinese should attempt to produce large numbers of air weapons they will be dependent on outside sources for their supplies. It will be some time before the Chinese are in a position to produce these materials in quantities commensurate with the requirement of large scale weapon production.

Nuclear Science:

The Chinese Communists are conducting an extensive nuclear science development program. It receives the greatest emphasis of any scientific endeavor in the country. With the exception of certain limited research within the universities and some of the more theoretical experiments within the Academy of Science, every phase of the nuclear program relies on Soviet assistance. Atomic energy equipment is furnished by the Soviet Union in return for uranium ore abundant in China. This great emphasis on nuclear

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potential exists for the Chinese Communist to produce smaller less complex weapons such as air-to-air missiles. With Soviet aid it is estimated that the Chinese can assemble and produce bombers and assemble ballistic missiles during the period of this estimate. Without Soviet aid no bombers or ballistic missile production or assembly is estimated.

**Nuclear Weapons** - It is almost certain that Communist China does not now possess her own nuclear weapons. It appears that with the Soviet aid provided to date, the CHICOMS can proceed with nuclear device development. The research and development required to progress from a basic scientific nuclear energy capability to a nuclear weapon capability is extensive, requiring a highly advanced scientific, technical and industrial complex which is not now available in China.

The Soviets, to date, have not appeared willing to provide specific nuclear weapons assistance in the form of nuclear material, weapon components or techniques and therefore it is probable that the CHICOMS will be forced to depend on development of a native nuclear weapons program. It is doubtful if the capability for native production of nuclear weapons will exist before the 1970's, although a test device could be detonated earlier.

**Air-to-Air Missiles** - It is believed that no native capability for production of air-to-air missiles presently exists. However, it is probable that Soviet air-to-air missiles are in the possession of the CHICOMS. With this base, native production of Soviet missiles could be undertaken if the requirement existed.

There is no reliable evidence of native research and development of air-to-

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Since there is no known development program today, the production of a native air-to-air missile is unlikely during the next 5 years.

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BW-CW Weapons - The CHICOM research facilities which could be related to a BW-CW program are limited both in number and in scientific talent. No actual BW-CW offensive capability is believed to exist at the present although a research and development program probably is in progress.

There is slightly more evidence that a limited capability for defense against BW-CW attack exists, particularly for military personnel.

The importance placed upon BW-CW warfare by the CHICOMS is unknown, however, on the basis of expanding and improving research institutes which could be related to BW-CW, it is possible that the CHICOMS could develop a very limited native production capability by 1965.

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